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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/642,368 | 08/15/2003 | Richard Bajan | (49521) 59234 | 2534 |

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| EXAMINER | |
|---|---|
| BAREFORD, KATHERINE A | |
| **ART UNIT** | **PAPER NUMBER** |
| 1762 | |

DATE MAILED: 08/16/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/642,368 | BAJAN, RICHARD | |
| | Examiner | Art Unit | |
| | Katherine A. Bareford | 1762 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *31 July 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-51* is/are pending in the application.

4a) Of the above claim(s) *32 and 33* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *47-51* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Claims 1-31 and 34-46 are canceled

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 31, 2006 has been entered.

The amendment filed with the submission of July 31, 2006 has been received and entered. After the entry of the amendment, new claims 47-51 are pending for examination, claims 1-31 and 34-46 are canceled, and claims 32-33 remain withdrawn from examination.

The Examiner notes that the RCE submission refers to considering the arguments in the "Appeal Brief or Reply Brief previously filed on June 1, 2006". The Examiner understands applicant to be referring to the arguments in the After Final Amendment received June 5, 2006 with a certificate of mailing for June 1, 2006. There was no Appeal Brief or Reply Brief filed.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 47, 49 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knapp, et al "Waterjet roughened surface analysis and bond strength" (hereinafter Knapp Article) in view of Raghavan et al (US 5512318), EP 0 750 054 A1 (hereinafter '054) (as provided by applicant), Zheng (US 5817372) and Arnold et al (US 5956845).

Knapp Article teaches a method of applying a metallurgical coating to a superalloy substrate. Abstract and page 22, 2nd column. The substrate can be aircraft engine parts, such as blades and vanes. Page 22, 1st column. The superalloy would inherently have an underlying grain structure. A water jet is directed at the substrate to roughen the surface, thus modifying the surface morphology of the substrate in such a manner as to expose the underlying grain structure of the superalloy. Pages 22-23 and Tables 1 and 2. The water jet can have a pressure of up to 359 MPa (approx. 52,000 psi). Page 22, 2nd column. The sweep rate of the water jet can be 88.9 cm/min (34 inch/min) with a water jet pressure of 345 MPa (approx. 50,000 psi). Page 23, Table 1, examples WJ-1 and WJ-2. After water jet roughening, a metallurgical coating can be deposited on the modified surface of the substrate by thermal spraying, such as by plasma spraying. The paragraph bridging pages 23-24. The coating layer can have a thickness of 0.13 mm

or 0.38 mm, for example. See Table 1, examples WJ-1, WJ-2, page 23 and the paragraph bridging pages 23-24.

Claim 49: the coating can be an M Cr Al Y coating. See Table 1, examples WJ-1, WJ-2, page 23 and the paragraph bridging pages 23-24.

Knapp Article teaches all the features of these claims except (1) the standoff distance, (2) the HVOF spraying of the first coating, (3) the grit blasting of the substrate before roughening (4) heat treating of the first coating, (5) the application of the second coating (claims 47, 50) and (6)HIP treatment of the first coating.

Raghavan teaches a method of roughening surfaces such as aircraft engine parts prior to plasma spraying. Column 1, lines 5-20. The roughening is done by water jet. Column 1, lines 55-65. The water jet is positioned at a standoff distance of 0.25 to 2 inches from the substrate. Column 1, lines 60-68. The water jet pressure can be between 30,000 and 55,000 psi. column 5, lines 25-30. Raghavan teaches that the jet is traversed across the surface at a selected rate to uniformly roughen the surface, with degree of roughness based on, among other things, the pressure of the fluid, the standoff distance and the length of time the surface is in contact with the jet. Column 2, lines 1-15. Raghavan teaches to adjust the pressure, standoff and traverse rate until the desired surface roughness is achieved. Column 2, lines 10-25.

'054 teaches a method of applying a metallurgical coating to a superalloy substrate. Page 2, lines 35-45 and page 6, lines 40-50. The surperalloy would inherently have an underlying grain structure. A water jet of sufficient pressure is

directed against the substrate while traversing the surface at an effective sweep rate to modify the surface morphology of the substrate. Page 5, lines 25-45. This water jet treatment will expose the underlying grain structure of the superalloy. Page 3, lines 35-45, page 5, lines 25-45 and page 6, lines 5-20 (note the greater erosion of the water jet will erode away the initial grit blasted surface). A metallurgical coating can be deposited on the modified surface of the substrate by high velocity oxygen fuel (HVOF) spray or plasma spraying. Page 6, lines 40-50 and page 8, lines 34-35. The surface can be grit blasted to increase the surface roughness prior to treating the surface with a water jet. Page 4, lines 5-10 and page 6, lines 5-20. The coated substrate can be heat treated in a vacuum. Page 6, lines 40-50. The metallurgical coating can be an M Cr Al Y coating, where M is Co or Ni. Page 6, lines 40-50. The pressure of the water jet can be 50 ksi (52000 psi). See page 5, lines 25-45.

Zheng teaches a process for applying a metallurgical coating to a superalloy substrate. Column 4, lines 5-40 and figure 1. The substrate has a first metallurgical bond coating that can be applied by HVOF. Column 4, lines 45-50. The bond coating can be an M Cr Al Y coating where M is Co or Ni. Column 4, lines 30-40. The bond coating can also be an aluminum containing alloy. Column 4,lines 30-40. The applied bond coating is vacuum heat treated at, for example, 1080 degrees C (1976 degrees F) for about 4 hours in a protective vacuum atmosphere to enhance diffusion bonding between the bond coat and the substrate. Column 5, lines 40-50 and column 6, lines 1-20. Over the bond coating, a ceramic top layer is deposited by thermal spraying.

Column 4, lines 5-20. The ceramic ctop layer can be yttria stabilized zirconia. Column 4, lines 5-20.

Arnold teaches applying a thermally sprayed coating to a metal substrate, such as a turbine blade. Column 1, lines 10-30 and column 11, lines 30-68. A roughened substrate can be provided. Column 4, lines 40-50. A desirable coating is then applied to the workpiece substrate by HVOF spraying. Column 4, lines 40-65. After the coating is applied a desirable bond to the substrate is provided by subjecting the coated workpiece substrate to hot isostatic pressing. Column 5, lines 5-15.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to (1) modify Knapp Article to perform routine experimentation to optimize the standoff distance from the range given by Raghavan in order to provide an optimum degree of roughness, because Knapp Article teaches to water jet roughen the surface using a set pressure and traverse rate, and Ragahavan teaches that when using a water jet to roughen a surface to optimize the degree of roughening by adjusting the pressure, traverse rate and standoff distance, and that the standoff distance is desirably in the range 0.25 to 2 inches. (2) It would further have been obvious to modify Knapp Article in view of Raghavan to further provide the application of the coating by HVOF spraying as well as plasma spraying as suggested by '054 in order to provide a desirably coated surface, because Knapp Article in view of Raghavan teaches to apply the thermal spray coating by plasma spraying, and '054 teaches that when applying a thermal spray coating to a water jet roughened surface, it is desirable to use plasma

spraying or HVOF spraying. (3) It would further have been obvious to modify Knapp Article in view of Raghavan and '054 to further provide the pretreatment grit blasting as suggested by '054 in order to provide a desirably coated and bonded surface, because '054 further teaches that when applying a thermal spray coating to a water jet roughened surface, it is desirable to pretreat the surface by grit blasting. (4) It would further have been obvious to modify Knapp Article in view of Raghavan and '054 to further provide the heat treating of the coated substrate in vacuum as suggested by '054 and Zheng in order to provide a desirably coated and bonded surface, because '054 further teaches that when applying a thermal spray coating (such as by HVOF) of a material such as M Cr Al Y to a water jet roughened surface, it is desirable to heat treat in vacuum after coating and Zheng teaches that a desirable heat treatment in vacuum to a HVOF applied M Cr Al Y coating is four hours at 1976 degrees F to enhance diffusion. This temperature and time would inherently provide the claimed diffusion zone thickness, because the same temperature, time and materials as claimed are used. (5) It would further have been obvious to modify Knapp Article in view of Raghavan and '054 to further a second yttria stabilized zirconia ceramic coating as suggested by Zheng in order to provide a desirably thermal barrier coated surface, because Knapp Article in view of Raghaven and '054 teaches a method of applying a metal bond coating M Cr Al Y material, for example, to a superalloy substrate and Zheng teaches that after applying a M Cr Al Y bond coating material to a superalloy substrate, it is further desired to apply a ceramic yttria stabilized zirconia coating over the bond coating to provide a

thermal barrier protected substrate. (6) It would further have been obvious to modify Knapp Article in view of Raghavan, '054 and Zheng to also perform hot isostatic pressing of the coated substrate as suggested by Arnold in order to provide a desirably coated and bonded surface, because Knapp Article in view of Raghavan, '054 and Zheng teaches coating a substrate such as a turbine blade by thermal spraying and Arnold teaches that when coating a substrate such as a turbine blade by thermal spraying it is desirable to further heat treat the coated substrate by hot isostatic pressing in order to provide a desirably bonded coating.

4. Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over Knapp Article in view of Raghavan, '054, Zheng and Arnold as applied to claims 47, 49 and 50 above, and further in view of WO 02/40745 (hereinafter '745).

Knapp Article in view of Raghavan, '054, Zheng and Arnold teaches all the features of these claims except depositing a platinum aluminide metallurgical coating onto the surface of the substrate.

However, '745 teaches applying a thermally sprayed coating to a gas turbine components. See page 1, lines 1-5 and page 9, lines 15-25. A bond coating can be applied to the substrate by thermal spraying. Page 6, lines 10-25, page 9, lines 15-25 and page 10, lines 5-10. The bond coating can be platinum aluminide or a M Cr Al Y. Page 6, lines 10-20, page 9, lines 15-25 and page 10, lines 5-10.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Knapp Article in view of Raghavan, '054, Zheng and Arnold to use a platinum aluminde bond coating as suggested by '745 in order to provide a desirable coating, because Knapp Article in view of Raghavan, '054, Zheng and Arnold teaches that a thermal spray coating can be applied and that the thermal spray coating can be a M Cr Al Y type bond coating applied by thermal spraying and '745 teaches that when applying a bond coating by thermal spraying it is desirable to use M Cr Al Y or platinum aluminide.

5. Claim 51 is rejected under 35 U.S.C. 103(a) as being unpatentable over Knapp Article in view of Raghavan, '054, Zheng and Arnold as applied to claims 47, 48 and 50 above, and further in view of Darolia (US 6607611).

Knapp Article in view of Raghavan, '054, Zheng and Arnold teaches all the features of these claims except the precise ceramic composition of the second coating.

However, Darolia teaches applying a thermally sprayed bond coating to a metal substrate, and then applying a thermally sprayed, such as by plasma spraying, ceramic coating. Column 1, line 60 through column 2, line 25, column 5, line 55 through column 6, line 5 and column 15-30. The bond coating can be a M Cr Al X (where X can be yttrium) coating. Column 5, lines 55-65. The bond coating is roughened prior to applying the ceramic coating. Column 6, lines 10-20. Then a ceramic coating, which can

be zirconia stabilized with 4-8 wt% yttria, is applied by plasma thermal spraying. Column 6, lines 10-20.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Knapp Article in view of Raghavan, '054, Zheng and Arnold to use a ceramic coating that is, for example, zirconia with 8 wt% yttria as suggested by Darolia in order to provide a desirable thermal barrier, given that Knapp Article in view of Raghavan, '054, Zheng and Arnold teaches applying a bond coat material followed by a yttria stabilized zirconia coating to provide a desirable thermal barrier coating and Darolia teaches that after applying a bond coat material, it is desirable to further apply a ceramic top coat, which can be zirconia with 8 wt% yttria to provide a desirable thermal barrier coating.

6. The Examiner notes that Dietrich et al (US 2004/0043261) is the national state application of WO 02/40745 cited above.

7. The Examiner also notes White et al (US 5732467) as providing a HVOF applied coating that is vacuum heat treated and HIP treated. See column 6, lines 10-30.

*Response to Arguments*

8. Applicant's arguments with respect to claims 47-51 have been considered but are moot in view of the new ground(s) of rejection.

The Examiner has cited Zheng as to the specific heat treatment parameters.

*Conclusion*

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katherine A. Bareford whose telephone number is (571) 272-1413. The examiner can normally be reached on M-F(6:00-3:30) with the First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone numbers for the organization where this application or proceeding is assigned are (571) 273-8300 for regular communications and for After Final communications.

Other inquiries can be directed to the Tech Center 1700 telephone number at (571) 272-1700.

Furthermore, information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KATHERINE BAREFORD
PRIMARY EXAMINER